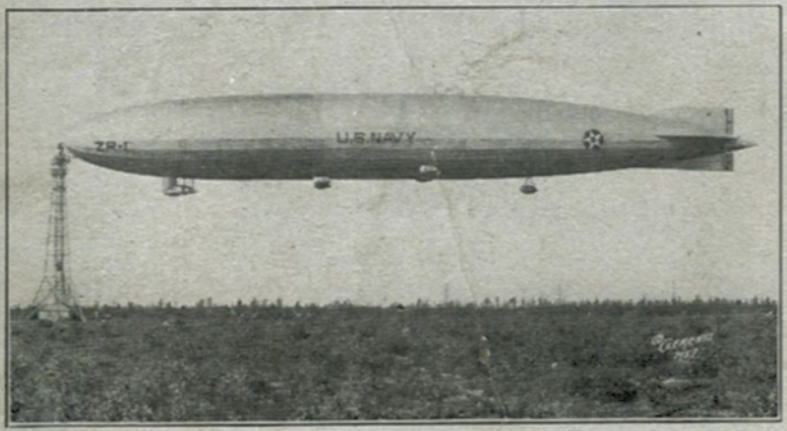
The Airship
SHENANDOAH

THE FIRST AMERICAN
BUILT RIGID AIRSHIP



U. S. S. SHENANDOAH
MOORED TO MAST
AT NAVAL AIR STATION,
LAKEHURST, N. J.

PERFORMANCE

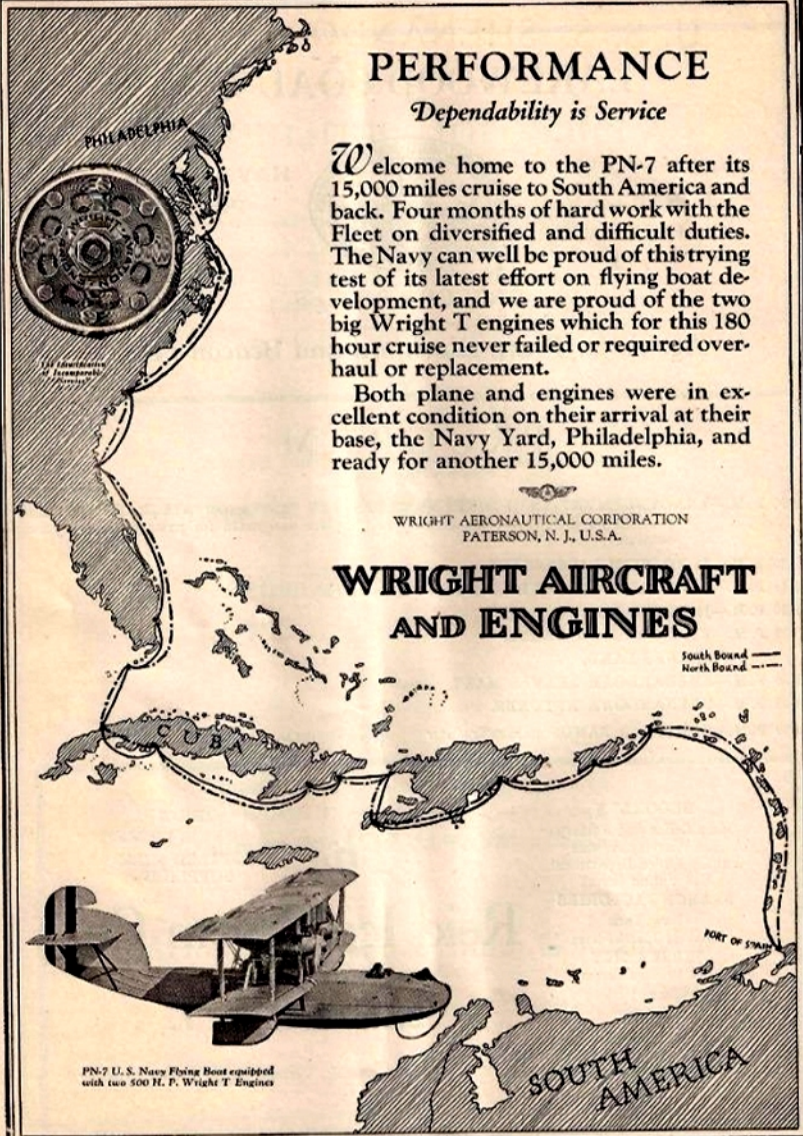
Dependability is Service

Welcome home to the PN-7 after its 15,000 miles cruise to South America and back. Four months of hard work with the Fleet on diversified and difficult duties. The Navy can well be proud of this trying test of its latest effort on flying boat development, and we are proud of the two big Wright T engines which for this 180 hour cruise never failed or required overhaul or replacement.

Both plane and engines were in excellent condition on their arrival at their base, the Navy Yard, Philadelphia, and ready for another 15,000 miles.

WRIGHT AERONAUTICAL CORPORATION
PATERSON, N. J., U.S.A.

WRIGHT AIRCRAFT AND ENGINES



PN-7 U. S. Navy Flying Boat equipped with two 500 H. P. Wright T Engines

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166 Lakewood

Asbury Bridge and Iron Works

STRUCTURAL ENGINEERS CONSULTING

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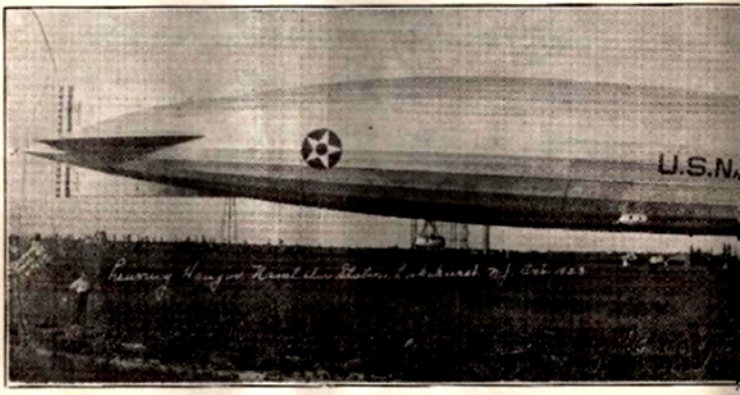
OPPOSITE FREIGHT STATION



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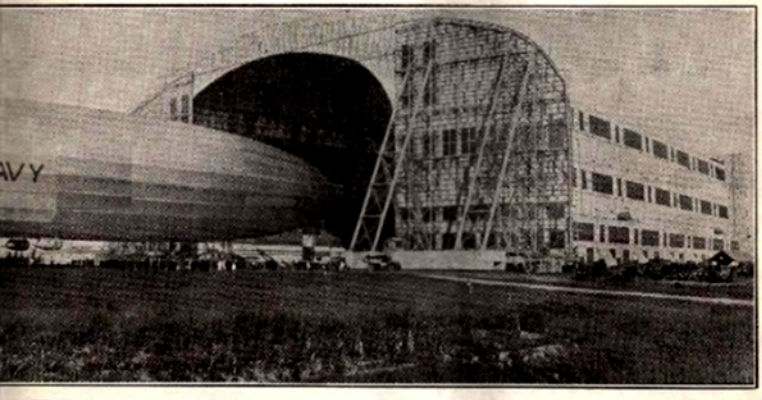

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477-478

U. S. S. SHENANDOAH (ZR-1)

General Characteristics

LT. COMD'R Z. LANSDOWNE
Commanding

Length—680 feet.
Diameter—78 feet.
Height—96 feet.
Gas capacity—2,150,000 cubic feet.
Total lift (helium)—about 130,000 pounds.
Dead weight—about 75,000 pounds.
Speed—about 75 miles per hour.
Horsepower—5 300 H. P. engines, total 1,500 H. P.
Cruising radius without stopping—over 4,000 miles.
Crew in flight—9 officers, 22 men.

THIS beautiful airship was designed by the Navy Department, fabricated by the Naval Aircraft Factory, of Philadelphia, assembled and erected at the Naval Air Station, Lakehurst, N. J. It is American-built throughout, and is operated by American Navy personnel.

The metal framework is of duralumin, a composition of aluminum, copper and manganese which has a tensile strength of mild steel and has only one-third of its weight. The gas bags, 20 in number, are made of a special cotton fabric; are lined with gold-beater's skin from the intestines of cattle, and are manufactured by the Goodyear Tire and Rubber Company. The outer cover is of cotton fabric, painted aluminum, and only serves as a weather protection and to stream-line the ship.

The engines are special gasoline engines, 6-cylinder 300 H. P., made by the Packard Motor Company. Each car carries one engine, except the forward car. The fuel used is gasoline, carried in a number of tanks in the inclosed keel of the ship. The amount carried depends on the length of the trip; 8,000 gallons can be carried.

The supporting gas is helium, a non-inflammable, non-poisonous gas and is the next lightest gas to hydrogen. It is found in the natural gas fields of Texas and Kansas. The Government has a plant for extracting this gas in Texas. This gas is not found in commercial quantities in any other countries of the world.

The ship is controlled from the forward car, the inside of which looks much like the bridge of a steamship. It is in communication with the ground by radio and radio telephone.

The Navy Department will operate this ship to demonstrate its usefulness not only for naval and military purposes but for commercial uses. It is hoped that you are now witnessing the forerunner of great commercial air lines of similar ships, carrying passengers and freight between our great cities, across the continent and to our island possessions.

The development of the mooring mast has enormously extended the field of usefulness of the airship for naval as well as commercial purposes. Heretofore the limiting factors have been the high cost of constructing huge sheds in which to house the airship and the difficulty involved in taking the airship in and out of these sheds without damage to structure in surface cross-shed winds exceeding fifteen miles per hour. The airship may moor to and cast off from the mooring mast in practically all weather conditions except the most severe gales and thunder storms. A mooring mast is at present being installed on board a surface vessel of the Navy (USS PATOKA) and it is expected that this arrangement together with certain masts on shore will permit the SHENANDOAH to operate successfully as an important scouting unit of the U. S. Fleet.

The ship is controlled from the foremost gondola, known as the "Control Car". This Control Car is to the airship what the bridge is to a steamship. In other words the Control Car is the Controling center of the entire ship. The control of the ship is accomplished on somewhat the same principle as a ship of the sea -- somewhat like that of a gas balloon -- somewhat like that of an airplane -- all combined in one.

For example.—The Steering is accomplished by a steering wheel very much like the steering wheel on the bridge of a yacht. By winding wheel to right the ship's head will move to right -- winding wheel to left ship's head will move to left.. The steering wheel is connected by a long system of wires which lead over rollers and moves the ship's rudder from side to side, thus giving directional control.

The altitude control (up or down) is accomplished by another wheel set at a different angle by winding the elevator wheel upward the nose of the ship will go up, by winding the wheel downward, the nose of the ship will go down, the elevator wheel through a long system of wires moves the horizontal surfaces at the tail of the ship and controls the up and down or altitude movements of the ship. In flight of course, there is a man stationed at each wheel. The Captain, Navigator, and Officer of the Deck takes Station in the Control Car. There are numerous instruments and control devices in the Control Car which have to do with the control of the ship. For example, if it is desired to send an order to the engineers on duty in power cars it is only necessary to move a lever which travels over a graduated dial in the control car indicating the order, movement of the lever rings a bell and operates a similar dial and bell at the engineers station, in each power car, thus, an order such as "start all engines", "stop", "go ahead one-third", "full speed", etc., is instantly transmitted to the desired part of the ship. In addition the ship is equipped with voice tube and telephone to all parts. There are instruments to tell the altitude of the ship, its inclination, its speed, etc. In the Control Car are also placed numerous valve control leads, and bombing releases. The helium gas and water valve control being centered here, the ship may also be controlled statically from this station in the following manner. For example, as stated before the ship includes among other things the working principle of a gas balloon, and consequently can be statically controlled.

Commanding
U. S. Naval Air Station
Lakehurst, N. J.

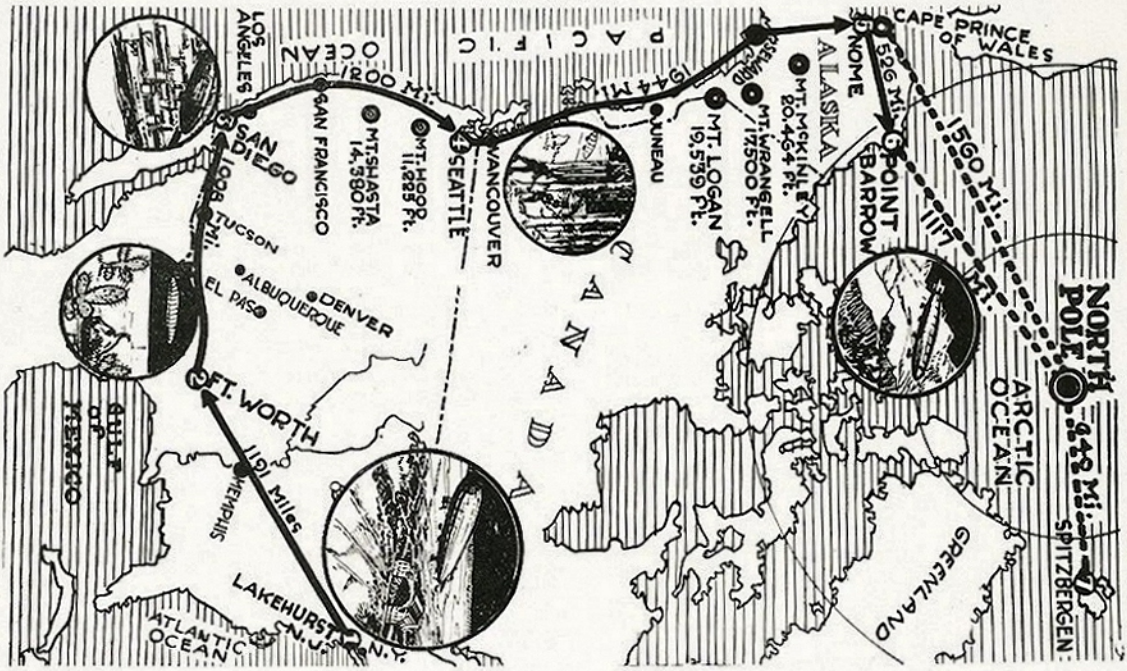
COMMANDER J. H. KLEIN, JR.
U. S. NAVY

Grouped at the Naval Air Station, Lakehurst, New Jersey are all the lighter than air activities of the American Navy. There the Shenandoah — our first American rigid airship was assembled tested and now operates. In addition to rigid airships we practice with and develop the non-rigids such as the J-1. The development of, and experiments with kite balloons are other aeronautical activities with which we are concerned. All the parachutes for the entire Naval Service are tested here. Visitors are welcome and have an opportunity to witness interesting features in activities.

The flying field 1,400 acres in area is one of the largest in the world. At a cost of $6,000,000 the Station gradually developed to its present size, with its huge hangar, mooring mast, aerological observatory (complete weather bureau), the helium purification plant, and shops for repairs and engine overhaul, it has every modern facility for the service of all types of lighter than air craft.

To operate the airship and plant we require approximately 50 officers, 400 enlisted men and 300 civilian workmen, with a guard of 100 Marines. In time of war this number would probably be trebled, and a number of airplanes assigned for protection of and cooperation with the big ships.

Shenandoah at the High Mast, Naval Air Station,
Lakehurst, New Jersey
From left to right:
Lcdr Lansdowne, Admiral Moffett,
Lcdr Pierce, Lcdr Deem, Army Colonel Hall



Proposed route of Shenandoah to Arctic Regions Courtesy R. A. Photo.

Preparations required for a trip to the pole and for extensive explorations.

"The Navy considers that with all the ships, the Shenandoah and planes equipped as recommended the Arctic Exploration is feasible and practicable without undue risk to personnel or material."

Icebound Explorer Sends Endorsement.

More can be accomplished in one flight over the Arctic by aircraft than has been accomplished in ten years of exploration was the endorsement given by Captain Donald B. McMillan to the plan of the Navy Department to send an Arctic Expedition North. (Captain McMillan is now exploring, 1924, in Far North in his ship "Bowdoin".

In addition to endorsing the plan for such an expedition, Captain McMillan offered every assistance possible in the way of furnishing information on weather conditions, to be radioed from the Bowdoin.

The Board gave the following summary of the purposes and possible accomplishment of the expedition:

Purpose of Expedition.

The purpose of naval exploration in the Arctic is to determine and chart the location of land in an area one-third the size of the United States. This 1,000,000 (one million) square miles lying between Alaska and the North Pole is as yet unexplored.

A single dash into such an area determines little. To know the area requires search and mapping by aerial photography in a systematic way. The work of the first summer could accomplish reconnaissance, the possible general location of some land, the proof of the feasibility of charting by the Airship Shenandoah and by planes equipped for work on ice and water, and the establishment of bases with dirigible mooring masts from which the whole work could be continued in the future.

REAR ADMIRAL W. A. MOFFETT, U. S. N.
Chief of the Bureau of Aeronautics, Navy Dept.

THE NAVY IN THE AIR

BY

Rear Admiral W. A. Moffett, U.S. Navy

THE development of naval aviation in the Navy though of comparatively recent origin, has made enormous strides in the past few years. From a handful of volunteers before the war, who worked with untiring zeal in the interest of naval aeronautics, this nucleus grew to a body of more than thirty thousand picked men, who carried on the work of naval aviation in this country and abroad during the World War. Naval planes escorted our troop ships through the submarine-infested waters of Europe. Naval aircraft carried out effective bombing raids against enemy bases and naval airships patrolled the seacoast of western Europe.

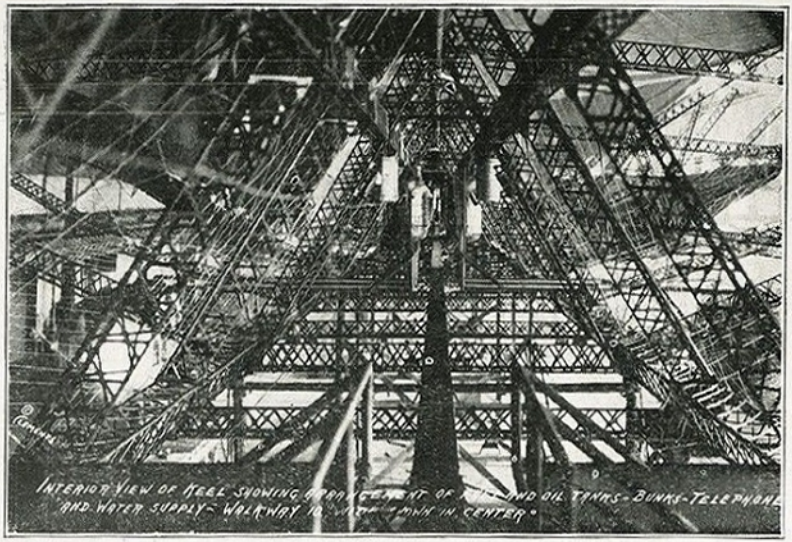
The first naval seaplanes were barely able to get off the water and perform the most rudimentary maneuvers in flight. In less than ten years from this beginning the giant NC-4 made the first trans-Atlantic passage by air and on one flight this type of seaplane carried fifty-one men. Within the past year the "SHENANDOAH," the first American-built rigid airship, has been completed and flown, a triumph of American engineering ability and skill, designed and fabricated by United States Naval personnel.

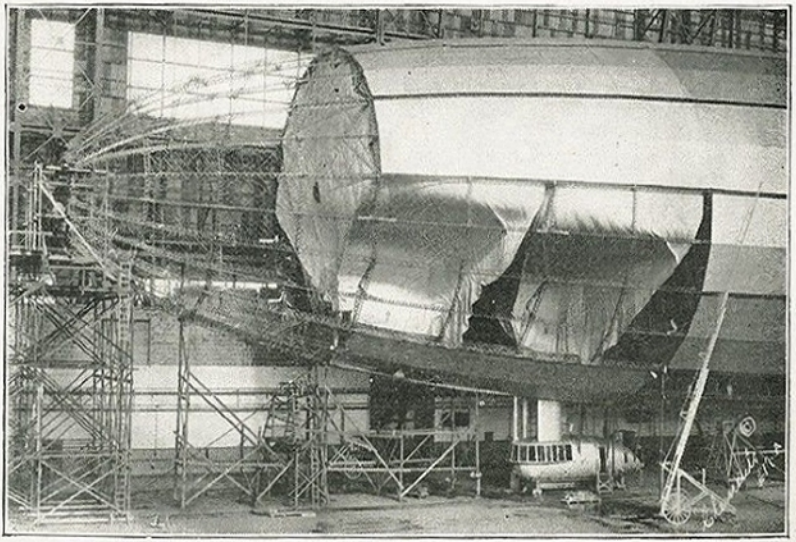
Naval aviation is today a vital part of the Fleet. It is used for scouting at sea over wide areas because of the distances that can be observed from the air, and the speed with which aircraft can travel. Aircraft are used for directing the fire of the battleships' guns, enabling them to make hits on a target which is out of sight of the surface ships. From his commanding position in the air the airplane spotter sends his directions to the firing ship by radio and enables the gunner to make "hits" on the target. Aircraft carriers are designed to carry all types of naval aircraft, including fighting planes, bombing planes, torpedo planes and scouting planes.

The fighting planes are used to gain and maintain aerial supremacy, driving enemy aircraft from the air, preparing the way for offensive operations by the bombers and torpedo planes. The scouting planes are sent on long distance reconnaissance and observation missions to seek out enemy forces and report their position and strength to the naval commander. Torpedo planes carry slung beneath them a torpedo such as is carried by submarines. Traveling at eighty miles per hour they launch their weapon at a target and then swoop up and away out of range of the enemy gunfire.

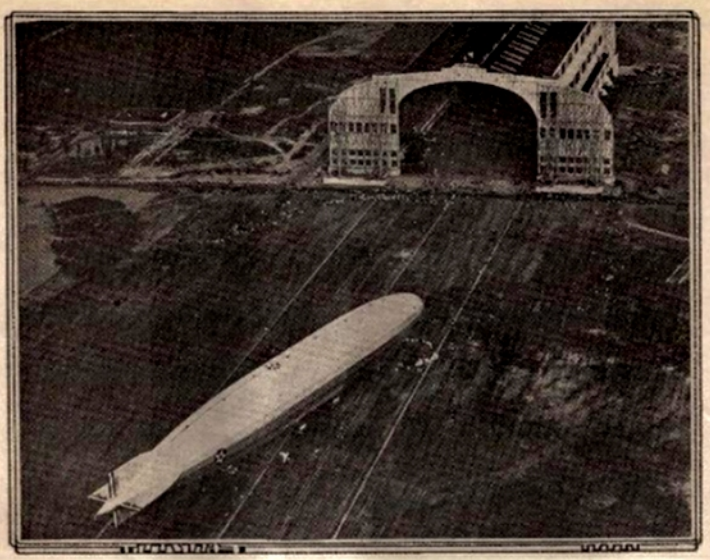
Practically every ship in the navy will have the service of aircraft to assist it in carrying out its mission. Airplanes are now carried on battleships and launched from the deck by means of a catapult which hurls the plane into the air with a speed of sixty miles per hour. The fast scout cruisers now being placed in service are also equipped in this manner. Planes have been designed and built which can be carried on board submarines. These aerial mosquitoes, when assembled and ready for flight, can be placed in the ordinary size living room. On the submarine they are disassembled and stowed away in a water-tight tank on deck.

Airships such as the "SHENANDOAH" are designed for long distance scout cruisers of the air. They are capable of flying several thousand miles without refueling, they would carry machine guns for defense against enemy attack in the air, and could be designed to carry their own aircraft for defense. The progress that has been made in aeronautics as a military and naval development may be considered a forerunner of commercial development in the air. Passengers and freight will in the course of a few years be carried on regular commercial air routes. Short distances will be negotiated by airplanes, and trans-continental and trans-oceanic journeys will be made most conveniently and speedily by airship.





Showing Framework, Arrangement of Gas Bags and Outer Cover.



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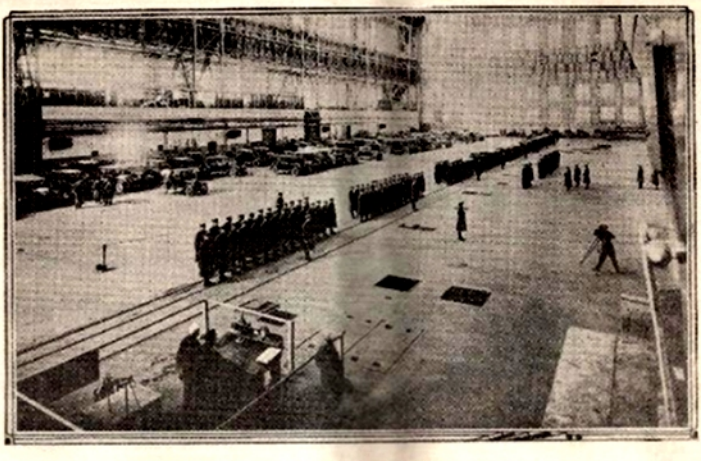

VIEW OF HALF THE AIRSHIP HANGAR

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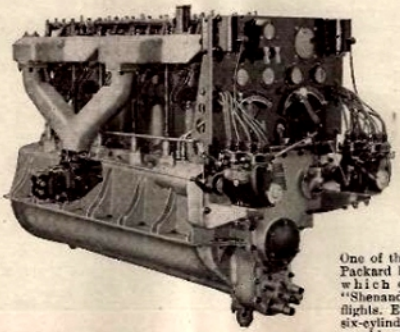


One of the battery of Packard built motors which drive the "Shenandoah" on her flights. Each of these six-cylinder engines is capable of developing 300 horse power.

PACKARD takes pride in the part it played in designing and building the power plant for the U. S. S. "Shenandoah." The same care and skill which developed these creations goes into every Packard Six and Packard Eight motor car.

PACKARD MOTOR CAR COMPANY

Detroit, Michigan

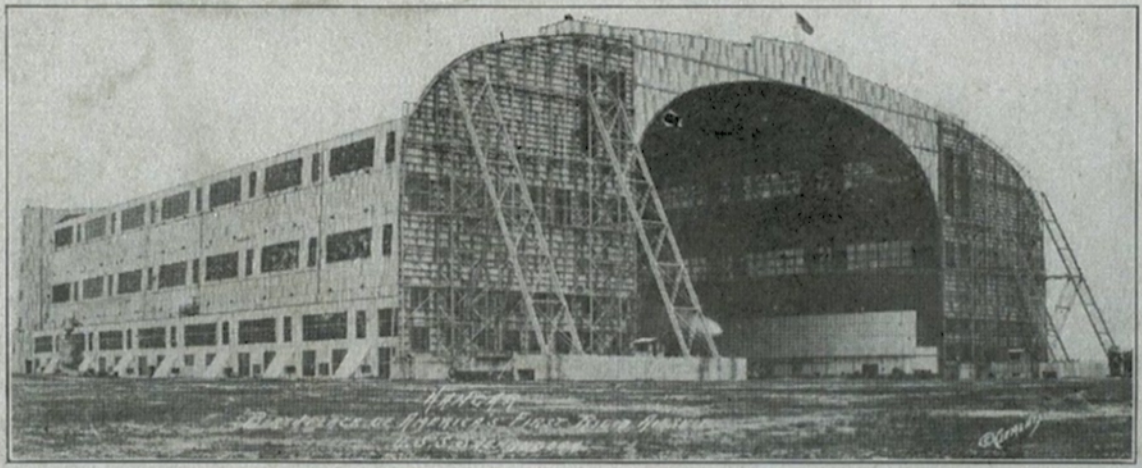
PACKARD

Photographs for Sale:

I have many photographs of U.S.S. Shenandoah, made during construction, of the first flight and later flights, including the cross-country flight, and photographs of the ship at the Naval Air Station, Lakehurst, New Jersey, and at Hangar 1.

For information, or additional copies of this booklet, write:

R. S. Clements
Lakehurst, New Jersey



HOME OF AIRSHIP SHENANDOAH

HANGAR AT NAVAL AIR STATION

LAKEHURST, NEW JERSEY